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WORDS AND SENTENCES IN SCIENCE AND INDUSTRY[1]

By E. J. CRANE

EDITOR, CHEMICAL ABSTRACTS, THE OHIO STATE UNIVERSITY

COOPERATION is the main highway of human progress. The use of words and sentences is the commonest vehicle traveling this highway. Too often this vehicle of cooperation shows the need of lubrication. Too often it breaks down. Its utility is none too good at best, for the indefiniteness of words, as used and as understood, limits communication tyrannically. The failure of our communication vehicle continuously to function smoothly is not surprising; the imparting of information and ideas by the enunciation or writing of words and sentences is really a most complicated procedure. An ordered and modulated series of sounds is made in a well-nigh infinite variety of combinations, and listeners frequently understand. Marks are rapidly made one after the other on some surface, and readers find meaning in them. Because the ability to talk or write and to gain information by listening or reading is common the remarkability of this distinctive human attribute is not generally realized. Because the use of words and sentences is universal, adequate capability in their use tends to be taken for granted.

Science is exact. Industry is exacting. Men in science and industry therefore have special need for skill in clear and accurate communication one with another.

Mathematics is a language. Like a sentence a mathematical equation conveys a complete thought. So does a chemical equation. Scientists work with these languages and in these distinctly scientific modes of expression they recognize the necessity for the use of correct symbols and for proper balancing of equations.

Words are symbols, too, and sentences, like equa-

[1] Address delivered in New York, on November 5, by the recipient of the Chemical Industry Medal for 1937 presented by the American Section of the Society of Chemical Industry.

tions, require balancing. Many workers in science are less careful to be exact in their use of words and sentences than they are in writing equations or in making graphs or drawings. This carelessness is a source of some weakness in scientific progress. Chemical and other scientific nomenclature is often confusing, and English in science too frequently lacks clearness.

The value of good English is pretty generally recognized. English is universally a required course in our universities. "An extensive knowledge of the exact meanings of English words accompanies outstanding success in this country more than any other single characteristic." This quoted conclusion was reached by Johnson O'Connor,[2] director of the Human Engineering Laboratories at Stevens Institute of Technology, after an extensive investigation. The value of good nomenclature and good English in science and industry is not without recognition. Yet my constant work with chemical publications leads me to feel that emphasis is needed. If this emphasis could be made so strong as to stimulate effort for improvement by students, by writers and by editors and so graphic as to get the half-convinced over the fence and assiduously at work, the complexion of scientific and technical literature would clear and brighten. A good many people still think of a study of English as purely cultural. Skill in the use of English is a mark of culture, but it is also a very practical matter.

Perhaps I have been stating obvious facts; yet the obvious, fundamental, everyday consideration is sometimes taken for granted and therefore neglected. Taking things for granted is unscientific. The care, the skill and the scientific attitude of the laboratory, where scientific and technical results are obtained, are appropriate in reporting these results. Exactitude in reporting lags behind exactitude in discovering.

Words

All branches of science naturally have nomenclature faults and needs just as all have accepted standards. The need for names springs up ahead of the acquisition of thorough knowledge of the substances, properties, phenomena or processes brought to light in research. Names are, therefore, coined with insufficient information and frequently by investigators unskilled in nomenclature. They see only a partial picture of that which is being named and of the nomenclature of their fields. Indeed, many times so-called scientific names are coined on amateur night.

Needed information for naming is perhaps never complete. F. Richter, editor of Beilstein's Handbuch, said in a recent letter, "All reflections on nomenclature seem to be inevitably doomed to incompleteness because of the overwhelming variety of facts to be considered and the impossibility of duly taking into account all implications."

Frequently several names spring up where only one is needed. These cause confusion which at times seems endless, for once a name gets a reasonably good start it is headed off with difficulty. Multiple names in many instances have persisted for many years.

An excellent example of early cooperation to avoid multiple names is to be found in a recent occurrence. In 1935 a new alkaloid from ergot was independently isolated within a relatively short period in four different laboratories. At first there was some doubt as to the identity of the four products. Four names were proposed: ergometrine (by Dudley and Moir), ergotocin (by Kharasch and Legault), ergobasine (by Stoll and Burckhardt) and ergostetrine (by Thompson). The discoverers exchanged samples and decided they had identical products. Then the Council on Pharmacy of the American Medical Association adopted "ergonovine" as an acceptable non-proprietary substitute name. The council selected this name because of a rule against the recognition of names which are therapeutically suggestive.

The effort to systematize and to standardize is a continuous one. It is properly, in most instances, an international problem. The work is usually done by committees. As these committees are made up of busy men, widely scattered, progress is slow. Advances in science and industry would be distinctly helped if a more practicable and speedier method of word standardization could be found. Words are everyday tools. There would be adequate work in most branches of science for one or more nomenclature experts, employed as such, who could spend their full time in the name tool shop. They could help to solve the nomenclature problems of individual scientists and could assemble the considerable information needed by committees when more general decisions are necessary.

Editors have an opportunity to help make nomenclature in published papers conform with most generally accepted usage. Many endeavor to do this; others are lax. Authors who are rugged individualists, who are nationalists or who are too old to make changes sometimes handicap the efforts of editors.

Bacteriology presents a good example of the nomenclature difficulties which arise when knowledge is inadequate. Bacteriology is a comparatively young science. The general factors considered in classifying microorganisms are morphology, biochemical properties and pathogenicity. Many of the numerous classifications of bacteria which have been proposed are based on meager information compared to that obtainable from the large number of tests routinely applied to-day. Bacteriological literature is accordingly far from being in a satisfactory condition, and the workers

[2] *Atlantic Monthly*, 153: 160–6, 1934.

in this field are struggling with their nomenclature problems.

"In mineralogy it would take a book to discuss the problems of nomenclature," Edgar T. Wherry said to me recently. This field serves as an example of the difficulty in obtaining agreement. Some want to follow priority, others to follow usage when a mineral has more than one name, as many minerals do. Some want Dana's suggested *-ite* ending to be used as fully as practicable and others like the use, as well, of *-ine, -ote,* etc. There is wide divergence of opinion in usage as regards isomorphous series in spite of the strenuous efforts of the Nomenclature Committee of the Mineralogical Society of America to get general agreement.

With its quarter of a million known compounds and potentially many more, chemistry has one of the biggest nomenclature problems in science. Chemical nomenclature does not lag behind that of other sciences on this account, but there are pressing problems.

In organic chemistry the need for standardization in ring numbering is great. In an effort to bring system out of chaos Austin M. Patterson, American representative on the Committee for the Reform of Organic Nomenclature of the International Union of Chemistry, has worked out some systematic rules for position designation in cyclic compounds. These have been tentatively approved by the International Committee and, beginning in 1937, *Chemical Abstracts* will follow the rules in making index entries. Dr. Patterson and Leonard T. Capell have in course of compilation a catalogue of rings systems (there will be about four thousand of these) which will show the systematic numberings as well as other numberings in use. The publication of this catalogue in the near future is very desirable. Such undertakings are difficult to finance, but as they have fundamental significance, a way should be found.

In inorganic chemistry special difficulty is being encountered in naming coordination compounds and like complexes which are now being prepared in numbers. A wholly satisfactory naming system has not been found, but progress is being made (the German Commission for Nomenclature has recently made a valuable contribution[3]). The use of chemical formulas without an effort to coin names is a tendency in this field.

In the biochemical field the nomenclature of the proteins is fairly well established. The efforts of the International Union of Chemistry to establish a biochemical classification for fats, fat-like substances, carbohydrates and enzymes have not been effective. Carbohydrates and enzymes in particular are troublesome, carbohydrates to the organic chemist as well as to the biochemist. The hormones and vitamins present further examples of the chaos likely to arise in a new field of investigation. The chemical identification of some of these substances is beginning to help. Exclusive of the names of innumerable commercial preparations, some two dozen names have been used for the three principal estrogenic hormones, and even though the chemical structures have been determined and chemically correct names adopted by the Council on Pharmacy and Chemistry, some of these ambiguous names continue to be used.

In physical chemistry and chemical physics, words and symbols have been hard-pressed to keep up with the rapid strides made by investigators in recent years. Atomic disintegration and the separation of numerous isotopes have added one complication after another. The comparatively recent separation in quantity of the hydrogen isotope of mass 2, an advance of far-reaching significance, presented a nomenclature problem which will serve to illustrate some of the considerations properly kept in mind when names are coined. In deciding to recommend names for deuterium compounds which would differ as little as possible from those of the corresponding hydrogen compounds, the Nomenclature Committee of the American Chemical Society took into consideration such matters as (*a*) the existence of isotopes of many of the elements, (*b*) the fact that the isotopes of hydrogen are still forms of hydrogen and not new elements, (*c*) the effect of names and symbols on ease of thinking, (*d*) the teacher's view-point, (*e*) established nomenclature, (*f*) convenience and (*g*) indexing (this includes the use of indexes). If more of the haphazard naming in science and industry could be made to fit in with such general considerations, our nomenclature cart would not bump along so roughly and so slowly.

Trade names—of these there is no end. They multiply and they linger. If they are an evil they are no doubt a necessary evil; I do not gainsay their usefulness in trade. They are, however, the bugbear of scientific record keepers. Frequently they get into technical literature without definition or analysis. Editors have the lead and trumps and should work a squeeze play on undefined trade names—should refuse papers until lacking trade-name definitions are provided. Technical literature is not fiction. I mean it should not be. If in a story Edna Ferber wishes to name a mysterious character "Esmeralda" it is all right. Without an unmasked picture of the heroine, Esmeralda's activity in a pharmacological paper by John Scientist is much less exciting. Again, Taking Things For Granted is likely to be the villain.

Alloys, dyes and pharmaceutical preparations provide fertile trade-name fields. There are probably more than 10,000 alloy trade names in use. Each of

[3] *Chem. Weekblad,* 33: 722–30, 1936. (In English.)

the many producers is likely to have a long list of named alloys. Identical manufactured products with different trade names are not uncommon. In the Colour Index there are as many as 20 different names for some of the approximately 1,200 coal-tar dyes listed. When one encounters such names as Calite BL–28 or Buffalo Black 10B his hopes may mount that the numbers and letters are a clue to the discovery of systematic naming, but in so far as system exists it is limited and not generally helpful.

Trade names not infrequently come to be used so widely that they are taken over as public property and given official place in the English language, often to the dismay of manufacturers. Then of course definition in papers is no longer necessary.

Like college slang, "lab lingo" and industrial idiom are picturesque. I like them but not when used in wrong places, as in a printed scientific article. Some trade journals are full of such expressions and many readers are puzzled.

Sentences

This is no course in English and I could not pose as a teacher of English. The editorial blue pencil has grown stubby now, however, and perhaps there are one or two comments which can suitably be made.

Space limitations usually require that published papers be brief. Brevity is in many respects a virtue in itself, that is, down to the lowest point where clearness is retained. If in writing a paper the physical limitations are kept in mind from the beginning and the paper is built to fit, the product is usually better than the pared-down product of a longer paper. Abstracts are like papers in this respect.

A way in which brevity may be carried too far is to provide graphs and figures and say little more than "Here they are. Help yourself." Many an unbalanced meal has been eaten in a cafeteria-style restaurant. Statement of the author's interpretation of results is always of interest, often of value. Interpretation of the meanings of our accumulated data lags far behind anyhow.

In scientific writing the use of short sentences often helps. The fear of being misunderstood sometimes causes scientists to qualify and amplify until sentences become involved. Such sentences are like snowballs that have rolled down hill on a thawing day. They need to be broken up, and it is well to polish off sticks that have been picked up. Short sentences add emphasis. They wake up the reader lulled to a nap by a series of unrelieved long sentences. Too many short sentences, a staccato style, may be tiring, too, but a tendency in the direction of shorter sentences in scientific writing seems desirable. Clear-cut, lucid expression is helped.

Science calls for water-tight communication. May I try being a schoolmaster for a moment. Avoid loose construction. Avoid implied antecedents. A sentence should be so right that there can be no doubt as to its meaning. Join the minority and say "one tenth as large" instead of "ten times smaller." Be careful about hyphens. They can change the whole meaning of a phrase or sentence. Be precise. Say "sodium hydroxide" or "sodium carbonate" or "sodium bicarbonate" or "sodium oxide," whichever you mean, instead of "soda"—unless you make it clear that you are thirsty. Remember the reader.

Possibly the atrocious language of patents influences technical writing in general. Patent language is a law unto itself. I sometimes think a vigilance committee should take this law in hand. It is a menace. Dangling participles deserve their sentence less than that often assigned patents by puzzled patent perusers.

"Chemical Abstracts"

Chemical Abstracts, a key to the world's chemical literature, is built chiefly of words and sentences. It is encouraging to think of the 1937 award of the Chemical Industry Medal as a token of the usefulness of *Chemical Abstracts* to chemical industry. In a full sense *Chemical Abstracts* is a product of cooperation as well as a tool of cooperation. May I take this occasion to point with gratitude and with admiration to the fine spirit of helpfulness among American and other chemists which has been so big a factor in the production of *Chemical Abstracts.* There has never been a time when to obtain abstracting and editorial help has been difficult. A truly enormous amount of work has been accomplished by the faithful group of C.A. workers during the thirty years of the existence of *Chemical Abstracts,* and the work continues. I ask the privilege of sharing with them the implications of this medal. They deserve to share.

During the thirty years just mentioned *Chemical Abstracts* has grown from the publication of approximately 9,000 abstracts in a year to over 60,000 abstracts per year. The total abstracts for 1937 will be approximately 65,000. Of these about one third will be abstracts of patents. The number of abstracts of papers published is a pretty good measure of chemical activity. The total abstracts of papers for 1913, the year which preceded the year of the opening of the World War, was 19,025. The total dropped during the war to a low mark of 9,283 in 1918. It was not until 1923 that the total abstracts of papers returned to the 1913 level, the figure for 1923 being 19,507 abstracts. Since the total number of abstracts of papers in 1936 was 41,927, chemical activity throughout the world, thus reflected, can in one sense be said to have doubled during the past fourteen years and in another sense

owing to the effects of the World War, to have required twenty-four years to double.

* * *

The wide scope of chemistry is reflected by the abstracts and their classification in *Chemical Abstracts*. It is surprising how many chemical papers abstracted are found in journals devoted primarily to other sciences. Perhaps three fourths of the papers appearing in the physics journals are found to be of chemical interest. Most of our basic industries are in large part chemical industries, as the contents of the journals devoted to them show.

The more than 2,800 periodicals now systematically examined in the preparation of *Chemical Abstracts* are printed in 31 languages. The English language—English words and sentences again—is the medium for the printing of two fifths of these (18.1 per cent. from the British Empire and 22.2 per cent. from the United States). German periodicals come next with 14.9 per cent., followed by Russian with 7.3 per cent., then French 6.2 per cent., Japanese 5.5 per cent. and Italian 4.8 per cent. Russian and Chinese chemical periodicals have shown the most rapid increase in number during the past five years. Russian papers vary a good deal in value, but some are excellent and improvement is apparent. Will the reading of the Russian language have to be added to the equipment of chemists? Here and there throughout the world, outside the British Empire and the United States, English is now used to a considerable extent in the printing of scientific papers. This fact and the predominant position of English at present in chemical publication encourage the hope, faint though it is, that English may some day gain recognition as the "universal language" of science.

Chemical Abstracts has long striven for completeness. Completeness in an abstract service involves not only the reporting of all publications in its field, but also adequate abstracting of individual papers and thorough indexing. *Chemical Abstracts* publishes nothing that is new and yet endeavors to publish everything that is new in chemistry.

The indexes are regarded as the most important part of an abstract journal. The purpose of an abstract journal is largely defeated if all the information concentrated between its covers is not made quickly and certainly available by a good key, the index. *Chemical Abstracts* is about one third index. This is properly so.

Subject indexing calls for great care in the use of words. Indexes which are mere compilations of words are not subject indexes. There is a wide difference between a true subject index and a word index. Word indexing leads to omissions, scattering and unnecessary entries. Subject indexes, sometimes called analytical indexes, bring like things together no matter what they may be called elsewhere and tie related things together with a thorough system of cross references. Such indexes utilize classification in so far as it is serviceable. Sometimes the effort to break away from word indexing has led to the substitution of classification for subject indexing. Classification is an indexing tool, not the objective; its use can be easily overdone. Scientific literature would be strengthened if more of its indexes were made scientifically. Taking things for granted is again to blame; poor indexes result from an assumption that a knowledge of the subject-matter of a publication is all the equipment needed for indexing. Indexing is an art and science in itself and a good knowledge of nomenclature is needed. Good indexes are likely to be more exact in word usage than are the papers or abstracts indexed.

Those of us responsible for *Chemical Abstracts* believe in the possibilities for its usefulness. This evening's happenings encourage the belief and I am grateful. *Chemical Abstracts* is a living record of the forward march of men who, along with their fellow scientists, are doing more for the world than is any other group. Great men are in these ranks, greater men than the warriors and statesmen or politicians who so often receive acclaim. It is a privilege to be an observer and a recorder of this advance.

Some men with nothing to say say it very well. These writers and their readers accomplish nothing very pleasantly. The scientist has something to say, perhaps more to say than has anyone else. Curiosity, ingenuity and carefully acquired skill continuously carry him into new places and his interest there is in fact instead of favor, truth instead of ideas acquired on the basis of their appeal. The world needs facts and truths. The scientist's fellow workers need his cooperation. This useful citizen, the scientist, extends his usefulness when words and sentences, like test-tubes and tadpoles, are effectively at his command.

OBITUARY

GEORGE E. OSTERHOUT

GEORGE E. OSTERHOUT was one of the twin boys born to George Osterhout, Sr., and Emma (Harding) Osterhout, at Tunkhannock, Pa., on March 31, 1858. In recent years, he had not been physically strong. He succumbed at the age of 79, on April 2, to an attack of influenza when coronary thrombosis set in.

Mr. Osterhout, at the age of 27, went West, pri-

marily in search of health. For fifty-two years he had lived in Windsor, Colo., where he was known as a successful business man, a kindly neighbor, a loyal citizen, a philanthropic Christian, a scientist of more than local renown.

Before he went West he had earned his college degree at Lafayette College, at Easton, Pa., but graduation to him was not a finish: It became truly the commencement of his intellectual life. His library included many of the great books of all times, and was rich in the sciences of botany, zoology and geology, and also in religion and theology. The content of his library is a measure of the man.

He was a member of the Baptist church; studied law following his college days and was admitted to the bar in Pennsylvania; was a fellow and held "life membership" in the American Association for the Advancement of Science. He was a life member on the Board of Trustees of Keystone College, LaPlume, Pa. His Alumni Association kept his name continuously on its governing council.

The lumber business had engaged his attention since 1885, operated at first by himself but later as the "Osterhout and Charles Lumber Company."

The marriage of Mr. Osterhout and Miss Etta Thomas, of Greeley, in 1894 was an auspicious event. They established a home where their many friends found hospitality and good cheer. Both will be remembered for their quiet, generous, unassuming lives and for their unstinted service to the constructive affairs of the community. Mrs. Osterhout has indeed been the "good wife and helpmate in whom a husband may trust and in whose loving counsel he finds inspiration and strength."

Mr. Osterhout's accomplishments in the field of science may only be mentioned now. Suffice it to say that he stood among the foremost of those who are in the field of botany for the sheer love of the work, rather than as a means to a livelihood. In other words, business was his vocation and science his avocation and his special joy.

His collections are noteworthy in several fields, but his botanical collections are singularly fine. Probably among the privately owned and personally acquired and built, his herbarium has no equal in the West. Its value is not primarily a dollar value. There is hidden in it a personality. A lifetime of quiet enjoyment has gone into the making. The thought and ideals of the owner, as well as his sentiment and love for nature in all her moods is woven into it.

Those who knew him intimately will not forget his droll humor, his integrity and sincerity, coupled with modesty, humility and gentleness. The extent of his generosity will never be known, for his many benefactions were not heralded for his glorification nor to the embarrassment of those who were helped.

His annual field trips had become to him an *event* which, as a source of happiness, was equalled only by the subsequent hours and days spent in his herbarium-room studying the collections he had secured.

The *Greeley Tribune* in an editorial appreciation of him said: "Leisure time was never a problem to Mr. Osterhout. He has shown to others who dread compulsory retirement at 60 or 65 that their scientific achievements may be geared into public education if they possess aspiring zeal to vitalize the knowledge of the little world about them. School and college may enrich their courses through the results achieved by lay adult amateurs who are willing to share with others the riches they uncover."

The following summary of his papers is brief but it shows the extent of his work. A notable testimony of the esteem of his fellow workers is given by the many new species named in his honor. The list of papers is too long for the complete enumeration of the titles. He began publishing in 1898 and his last paper appeared in 1936. Suffice it to say, there appeared in *Bulletin of the Torrey Botanical Club,* 17 titles; in *Torreya,* 8 titles; in *The Plant World,* 3 titles; in *Muhlenbergia,* 12 titles. The total number of new species and new combinations proposed and published by him is seventy-one.

AVEN NELSON

RECENT DEATHS

DR. CHARLES HERBERT LAWALL, dean of pharmacy at the Philadelphia College of Pharmacy and Science, died on December 7 at the age of sixty-six years.

WATSON G. CLARK, for the last several years assistant state director of the Coast and Geodetic Survey for New Jersey, formerly state highway engineer, died on December 7. He was sixty-six years old.

DR. ARTHUR DAVENPORT BLACK, dean of the Northwestern University Dental School since 1917, died on December 7. He was sixty-seven years old.

WILLIAM COOMBS BAKER, since 1920 professor of physics at Queen's University, Kingston, Ontario, with which he had been connected since 1895, died on December 4 at the age of sixty-six years.

DR. GEORGE ALBERT BOULENGER, since 1923 director of the aquarium of the Zoological Society, London, formerly chief of the department of reptiles, batrachians and fishes at the British Museum (Natural History), died on November 23 at the age of seventy-nine years.

SCIENTIFIC EVENTS

STUDY OF THE GULF STREAM

THE Bermuda Biological Station and the Woods Hole Oceanographic Institution have undertaken a cooperative investigation of the long period fluctuations in strength of the Gulf Stream. The ultimate purpose of these studies is to learn whether or not the circulation of the ocean varies sufficiently from year to year to be an important factor either in the climate of northern Europe or in the success of the fishing on both sides of the North Atlantic.

Dr. J. G. F. Wheeler, director of the Bermuda Biological Station, who has just returned from England, stated that the eighty-foot motor yacht *The Culver* has been purchased with a grant of $25,000 from the Development Commission of Great Britain and probably would reach Bermuda in January or February to supplement the work of the Woods Hole vessel, *The Atlantis*.

Dr. Thompson, hydrologist of the John Murray expedition to the Indian Ocean, and Dr. H. V. Moore, of the Marine Biological Station at Plymouth, England, are joining the staff of the Bermuda laboratory to assist Dr. Wheeler during the period of the new project.

The Atlantis began making routine observations last June to follow the changes in volume of the Gulf Stream. When *The Culver* reaches Bermuda she will gradually take over some of this work. Data covering a period of at least five years will be needed before it can be known whether or not the variations are of sufficient magnitude to be helpful in long-range weather forecasting or in predicting the success of the European fisheries.

The British Development Commission is providing $17,500 annually for five years to permit the Bermuda Biological Station to carry out her share of the program. The various fisheries officials on both sides of the North Atlantic have agreed to help in correlating the variations in the catch with the temperature changes over the fishing banks that may result from the fluctuations of the major ocean currents.

It may be of interest to add that this new grant to the Bermuda laboratory was obtained by a special committee of the Royal Society which had been formed to help to develop Bermuda as an oceanographic base. At the same time that the observations for the physical program are being secured, a general biological survey of the Sargasso Sea will be carried out under Dr. Wheeler's direction.

COLUMBUS ISELIN

THE HARVARD UNIVERSITY COLLECTION OF GLASS FLOWERS

THE Harvard collection of glass flowers, one of the best known and most interesting exhibits in the university, according to the *Harvard Alumni Bulletin*, will probably receive no more additions, as Rudolph Blaschka, in whose studio at Hosterwitz, Germany, all the glass flowers have been made during the past fifty years, has been compelled to give up work because of age and impaired vision. He is eighty years old. The models now in the Harvard Museum represent about 720 species of flowering plants and more than 3,000 sections and magnified details.

It was in 1887 that Rudolph Blaschka and his father, Leopold, who died in 1895, sent the first small shipment of the glass flowers to Harvard. Since then the entire output of the studio has come to the university. The Blaschkas have done all the work alone, without the aid of an assistant or apprentice, and with Rudolph Blaschka's retirement there will be no one to continue the production. The last shipment, which consisted of fifteen fruit models, came in September, 1936.

Professor Oakes Ames, director of the Botanical Museum, says in his annual report: "A prolonged illness, and impaired vision brought about by the exacting nature of his art, have compelled Mr. Blaschka to cease work indefinitely. Indeed it is doubtful that he will add materially to the collection to which he has devoted the greater part of a long life. It is gratifying to report that Mr. Blaschka may look forward to a comfortable retirement through the generous terms of Miss Mary Lee Ware's bequest to the Botanic Museum."

Miss Ware, who died last January, made a bequest of $300,000 to support Rudolph Blaschka and his wife, to preserve the collection and to pay the Botanical Museum staff. Miss Ware and her mother, Mrs. Charles Eliot Ware, financed the collection from the beginning in memory of Dr. Charles Eliot Ware, of the class of 1834.

Professor Ames says in his report that more than 200,000 persons, doubtless attracted chiefly by the glass flowers, visit the Botanical Museum every year.

THE PITTSBURGH AWARD

THE Pittsburgh Award for 1937 was conferred upon Dr. Francis C. Frary, director of research of the Aluminum Research Laboratories of the Aluminum Company of America, by the Pittsburgh Section of the American Chemical Society. This honor was last conferred upon Andrew W. Mellon and Richard B. Mellon in recognition of their services to chemistry as evidenced in the founding of the Mellon Institute of Industrial Research. The formal presentation will be made at a meeting of the section on February 24.

Dr. Frary, through his achievements in the metallurgy of aluminum, has helped to bring to Pittsburgh an international reputation for research in metals. He

has been directing research in aluminum ever since he was appointed to his present post in 1918.

Born in Minneapolis, he studied at the University of Minnesota, where the degree of analytical chemist was conferred on him in 1905; a year later he received a master's degree. After studying at the University of Berlin, he joined the teaching staff of the University of Minnesota. His postgraduate work resulted in a doctor's degree, received in 1912.

In 1915 Dr. Frary joined the staff of the Oldbury Electrochemical Company, Niagara Falls, N. Y., as research chemist. There he acquired a special experience in the production of phosgene, which led during the war to his selection, with Professor D. J. Demorest, to build and operate a phosgene plant at Edgewood Arsenal. At the close of the war, Dr. Frary was a major in the Chemical Warfare Service.

In December, 1918, he took up his work as director of research of the Aluminum Company of America. Starting at New Kensington with a small group of men, he gradually built up the Aluminum Research Laboratories to their present position. In the past nineteen years, Dr. Frary made important contributions to the chemistry and metallurgy of aluminum. Among the many achievements which have been credited to him may be mentioned the production, for the first time, of very pure aluminum (99.98+ per cent.) by an electrochemical process, and the production of pure aluminum oxide by an electrothermal process.

THE AMERICAN ACADEMY OF TROPICAL MEDICINE

THE fourth annual meeting of the American Academy of Tropical Medicine convened in New Orleans on December 3. At the dinner Dr. George C. Shattuck, department of tropical medicine, Harvard University, Boston, Mass., presided as toastmaster. The presidential address, entitled "The Importance of Environment in the Study of Tropical Diseases," was delivered by Dr. Wilbur A. Sawyer, director of the International Health Division of the Rockefeller Foundation, New York City. The first award of the Theobald Smith Medal of Washington University was made by Colonel Charles F. Craig, past president of the academy, to Dr. Marshall A. Barber, staff member of the International Health Division of the Rockefeller Foundation, for his many significant laboratory and field contributions to tropical medicine. In announcing the award of this medal in the issue of SCIENCE for December 3, an error was made through which the names of Colonel Craig and Dr. Barber were reversed.

Colonel R. A. Kelser, the U. S. Army Medical Research Board, Ancon, Canal Zone; Dr. J. C. Bequaert, department of tropical medicine, Harvard Medical School, and Dr. Norman R. Stoll, Rockefeller Institute for Medical Research, Princton, were elected members, and Sir S. Rickard Christophers, London School of Tropical Medicine and Hygiene, London; Professor Jerome Rodhain, Institut de Médecine Tropicale Prince Léopold, Anvers, Belgium, and Dr. Henrique do Rocha Lima, Instituto Biologico, São Paulo, Brazil, were elected honorary members. Newly elected officers and councillors were as follows: *President,* Colonel Joseph F. Siler, Army Medical School, Washington, D. C.; *Vice-president,* Professor W. W. Cort, School of Hygiene, the Johns Hopkins University; *Secretary,* Professor Ernest Carroll Faust, department of tropical medicine, Tulane University of Louisiana; *Treasurer,* Dr. Thomas T. Mackie, Cornell Medical Center, New York City; *Councillors,* Professor Malcolm H. Soule, Hygienic Laboratory, University of Michigan (1 year); Professor Alfred C. Reed, Pacific Institute of Tropical Medicine, University of California (5 years); academy representative on the council of the American Association for the Advancement of Science, Dr. Malcolm H. Soule; academy representative on the council of the American Foundation for Tropical Medicine, Dean Earl B. McKinley, George Washington University.

ERNEST CARROLL FAUST,
Secretary

THE THIRD INTERNATIONAL CONGRESS FOR MICROBIOLOGY

THE third International Congress for Microbiology will be held at the Waldorf-Astoria Hotel, New York City, from September 2 to 9, 1939, under the auspices of the International Association of Microbiologists.

Dr. T. M. Rivers, of the Rockefeller Institute for Medical Research, is president of the congress; Dr. M. H. Dawson, of the College of Physicians and Surgeons, Columbia University, is general secretary, and Dr. Kenneth Goodner, of the Rockefeller Institute for Medical Research, is general treasurer.

The congress will be composed of the following nine sections:

General Biology: Variation and Taxonomy: convener, C.-E. A. Winslow.

General Biology: Microbiological Chemistry and Physiology: convener, Stuart Mudd.

Viruses and Viral Diseases: convener, W. A. Sawyer.

Rickettsiae and Rickettsial Diseases: convener, Hans Zinsser.

Protozoology and Parasitology: convener, H. W. Stunkard.

Fungi and Fungous Diseases: convener, B. O. Dodge.

Medical and Veterinary Bacteriology: convener, F. P. Gay.

Agricultural and Industrial Microbiology: convener, S. A. Waksman.

Immunology: convener, M. Heidelberger.

The registration fee will be $5.00, which will not include the cost of a banquet ticket or a copy of the *Proceedings* of the congress.

A World's Fair will be held in New York City during the summer of 1939. Consequently, those who wish to attend the Congress for Microbiology should make plans promptly. The American Express Company, the official travel agency for the congress, will be glad to assist in such plans.

SCIENTIFIC NOTES AND NEWS

AT the annual meeting of the trustees of the Carnegie Institution of Washington, Dr. John C. Merriam, for the past sixteen years president of the institution, presented his resignation, to take effect at the end of next year. The trustees voted to make Dr. Merriam president emeritus "with a grant sufficient to insure the effective continuation of his research work under the auspices of the institution." The board elected two trustees: Elihu Root, Jr., of New York, to succeed his father, and Henry R. Shepley, of Boston, architect. Trustees who attended the meeting were: Dr. Thomas Barbour, Cambridge, Mass.; James F. Bell, Minneapolis; Robert Woods Bliss, Washington, D. C.; Frederic A. Delano, Washington; W. Cameron Forbes, Boston; Walter S. Gifford, New York; Frank B. Jewett, Charles A. Lindbergh, Boswell Miller, Henry S. Morgan and Stewart Paton, of New York; John J. Pershing, Washington; William Benson Storey, Chicago; Richard P. Strong, Boston; Charles P. Taft, Cincinnati; Frederic C. Walcott, Hartford, Conn., and Dr. Lewis H. Weed, Baltimore.

THE following grants-in-aid have been made by the National Advisory Cancer Council: to Dr. Louis F. Fieser, of Harvard University, $20,550 toward work for a three-year period on the synthesis of carcinogenic compounds; Edward W. Wallace, University of Cincinnati, $4,350, for work over a period of two years on the relation of the anterior pituitary to carcinogenesis; E. O. Lawrence, University of California, $30,000, toward the establishment of a cyclotron laboratory for biological and clinical work with special reference to the treatment of cancer.

MEDALS of the American Society of Mechanical Engineers have been awarded as follows: The medal of the society for 1937 to Edward P. Bullard, president of the Bullard Company, Bridgeport, Conn., for "preeminent leadership in the development of station-type machine tools"; the Holley Medal to Dr. Frederick Gardner Cottrell, of the Research Corporation, Washington, D. C., for his "preeminent service in the invention of electric precipitation, the advancement of the science of gas liquefaction and for his gifts for engineering research"; the Worcester Reed Warner Medal to Clarence F. Hirshfeld, chief of research of the Detroit Edison Company, for "research and contributions to the theory and practice of heat power engineering"; the Melville Medal to Alfred J. Buchi, of Winterthur, Switzerland, for his paper, "Supercharging of Internal Combustion Engines with Blowers Driven by Exhaust-Gas Turbines," and the Charles T. Main Award to Allan P. Stern, of the Colonial Iron Works, Cleveland, for his paper on "The Influence of the Introduction of Labor-Saving Machinery upon Employment in the United States." Lorenzo Allievi, of Rome, who is now eighty-one years old, was elected an honorary member in recognition of his work in hydraulics.

THE Leidy Medal, presented every third year by the Academy of Natural Sciences of Philadelphia, was awarded on December 7 at a meeting of the council of the academy to Dr. Edwin Linton, research fellow in zoology at the University of Pennsylvania, in recognition of his work on the worm parasites of American marine fishes. The award, a bronze medal and an honorarium, was founded in 1923 in memory of the late Dr. Joseph Leidy, president of the academy from 1882 until his death in 1891. Previous winners of the medal include Professor H. S. Jennings, director of the Biological Laboratories of the Johns Hopkins University; Dr. Henry A. Pilsbry, curator of mollusks at the academy; the late Dr. William Morton Wheeler, and Gerrit Smith Miller, Jr., curator of mammals in the U. S. National Museum at Washington. The committee making the award included Dr. William K. Gregory, of the American Museum of Natural History, *chairman;* Dr. George H. Parker, emeritus professor of zoology, Harvard University; Dr. Alexander G. Ruthven, president of the University of Michigan; Dr. Francis W. Pennell, curator of botany at the academy, and Dr. Philip P. Calvert, professor of zoology at the University of Pennsylvania and research associate of the academy.

THE Gold Scheele Medal of the Swedish Chemical Society, awarded for "outstanding biochemical research," was presented at a meeting held in Stockholm on November 5 to Dr. James B. Sumner, professor of biochemistry at Cornell University, in recognition of his research on enzymes.

ROBERT LINTON, consulting engineer of Los Angeles, Calif., received the degree of doctor of science from Washington and Jefferson College at ceremonies con-

nected with the celebration of Founders' Day. The degree was conferred in recognition of his work in connection with the introduction of methods of technical control in the glass industry; in mining engineering for his work with cyaniding and in the standardization of operations in copper mines, and for his engineering contributions to the clay products industry.

DR. HARVEY NATHANIEL DAVIS, president of Stevens Institute of Technology at Hoboken, N. J., was inducted into the presidency of the American Society of Mechanical Engineers at the fifty-eighth annual meeting on December 6. He succeeded James H. Herron, president of the James H. Herron Company of Cleveland. Vice-presidents elected to serve on the council were: Bennett M. Brigman, dean of the Speed Scientific School of the University of Louisville; Frank O. Hoagland, of Pratt and Whitney; Harte Cooke, of the American Locomotive Company; Warren Horton McBryde, consulting engineer of San Francisco, and L. W. Wallace, director of research for the Crane Company of Chicago.

THE American Society of Agronomy and the Soil Science Society of America held their annual meeting in Chicago from November 30 to December 3. Officers of the American Society of Agronomy elected for next year are: *President,* Emil Truog, University of Wisconsin; *Vice-president,* Ralph J. Garber, Bureau of Plant Industry; *Chairman of the Soils Section,* A. M. O'Neal, Bureau of Plant Industry; *Chairman of the Crops Section,* Ide P. Trotter, Texas Agricultural and Mechanical College; *Editor,* J. D. Luckett, New York Agricultural Experiment Station; *Secretary-Treasurer,* F. B. Smith, University of Florida. Emil Truog, University of Wisconsin, and H. K. Hayes, University of Minnesota, were selected to represent the society on the Council of the American Association for the Advancement of Science in 1938. P. V. Cardon was selected as executive representative and R. M. Salter as alternate on the National Research Council in the Division of Biology and Agriculture for the three-year period from July 1, 1938, to June 30, 1941. Officers of the Soil Science Society of America elected for next year are: *President,* A. M. O'Neal, Bureau of Plant Industry; *Secretary,* W. A. Albrecht, University of Missouri, and *Treasurer,* F. B. Smith, University of Florida.

DR. R. E. PRIESTLEY, vice-chancellor of the University of Melbourne, has been elected vice-chancellor of the University of Birmingham. Dr. Priestley was a member both of the Shackleton Expedition to the Antarctic from 1907 to 1909 and the Scott Expedition from 1910 to 1913.

DR. JOHN EDWARD HOFFMEISTER, professor of geology at the University of Rochester, has leave of absence for the second semester of 1937–1938 to accept an appointment as visiting professor of geology at the University of Hawaii.

GILBERT W. BOYD has been appointed assistant professor of metallurgy at the Michigan College of Mining and Technology. He takes the place of Harold Walker, who has become assistant professor of metallurgy at the State College of Washington.

DR. RUDOLF KINGSLAKE, associate professor of geometrical optics at the University of Rochester, has resigned to become a member of the staff of the Eastman Kodak Company.

DR. EUGENE H. POOL, senior attending surgeon of the New York Hospital and professor of clinical surgery at the Cornell University Medical College, has been elected an alumni trustee of Columbia University. Dr. Pool will fill the vacancy caused by the death on August 18 of Dr. Everett W. Gould.

CLIVE FORSTER COOPER, director of the University Museum of Zoology, University of Cambridge, and fellow of Trinity Hall, has been appointed director of the British Museum (Natural History) on the retirement on February 2 of Dr. C. Tate Regan, who has been director since 1927. Mr. Cooper is known for his work upon the vertebrates, both recent and fossil.

THE delegation of scientific men arranged by the British Association at the request of the Indian Science Congress sailed on November 26 to attend the celebration of its twenty-fifth anniversary at Calcutta. The meeting will be held from January 3 to 9. The late Lord Rutherford was to have presided; his place has been taken by Sir James Jeans. The presidential address prepared by Lord Rutherford will be communicated to the congress by Sir James.

E. F. BURCHARD and C. W. Cooke are engaged in a field conference with members of the Public Health Service in regard to an investigation of the possible influence of geologic conditions on the prevalence of tuberculosis. They are giving special attention to Coffee County, Alabama, and Giles County, Tennessee, which are similar in area and amount of population but differ markedly in the prevalence and type of tuberculosis.

DR. FRANCIS F. SCHWENTKER, director of medical research for the Baltimore City Health Department, expects to leave for Rumania early in 1938 to conduct research on scarlet fever under the auspices of the Rockefeller Foundation.

AMONG those recently named members of the drainage basin committee for Minnesota, which will aid in preparing a comprehensive national plan for prevention and control of floods and the development of a water and soil conservation program, are the following

members of the faculty of the University of Minnesota: Dr. Richard E. Scammon, of the Medical School, *chairman;* Professor Frederic Bass, head of the department of civil engineering; Dr. George M. Schwartz, associate professor of geology; Dr. Lorenz G. Straub, professor of hydraulics and administrative assistant for the College of Engineering and Architecture, and Professor Raphael Zon, director of the Lake States Experiment Station.

DR. ROBERT A. MILLIKAN, of the California Institute of Technology, Pasadena, gave on December 7 an address at a general convocation at the University of Cincinnati. He spoke on "Science and Individual Opportunity in the Future." Following the convocation Dr. Millikan was guest of honor at a luncheon given by the university section of Sigma Xi.

DR. DAYTON C. MILLER, professor of physics at the Case School of Applied Science, will present a series of three popular science lectures for young people on December 27, 28 and 29 at the Franklin Institute in Philadelphia. These lectures were inaugurated in 1926 under the James M. Dodge Lecture Foundation, and are designed to show by means of experiments the connection between the labors of the scientific men and the effect these labors have on the every-day life of the world. The series is entitled "Sparks, Franklin's Lightning and Jove's Thunderbolts."

ALFRED C. LANE, Pearson professor of geology and mineralogy, emeritus, at Tufts College, gave a lecture at the University Club in Boston on November 23. His subject was: "Does Mother Earth Show Her Age?"

DR. R. R. WILLIAMS, chemical director of the Bell Telephone Laboratories, New York City, gave on December 16 an address on "The Quest for Vitamin B" at a meeting of the Washington Academy of Sciences.

AUSTIN H. CLARK, of the U. S. National Museum, will be the principal speaker on December 7 at ceremonies connected with the celebration of the hundredth anniversary of the Medical College of Virginia at Richmond. The celebration is the last major event on the program of the Richmond Bicentennial.

DURING the coming meeting of the American Association for the Advancement of Science at Indianapolis, the American Society of Naturalists, in addition to arranging the Biologists' smoker on Tuesday evening, is presenting a symposium on Thursday afternoon on "The Nature of Protoplasm," with Drs. W. M. Stanley, S. C. Brooks and Robert Chambers as speakers. At the dinner on Thursday evening Dr. David H. Tennent will give the presidential address on "Some Problems in the Study of Photosensitization."

THE second annual symposium of the Division of Physical and Inorganic Chemistry of the American Chemical Society will be held in Cleveland at the Hotel Statler on December 27, 28 and 29.

DISCUSSION

MAN AND PLANTS IN ALASKA

THAT human agencies directly or indirectly have, wherever man lived, influenced more or less the plant life of the region, is in general well known, but the subject appears never as yet to have been dealt with universally or exhaustively. A highly interesting manifestation in this line occurs in Alaska.

For twelve years now there have been going on, under the auspices of the Smithsonian Institution and the National Museum, anthropological and archeological explorations of Alaska and the Aleutian Islands. Initiated by the writer in 1926 these expeditions have now covered the principal Alaskan rivers, most of the coasts, Kodiak Island and the main parts of the Aleutian chain.

One of the main results of these explorations has been the location of literally hundreds of more or less ancient sites of what once were native villages. And these sites were found to present interesting botanical conditions. They as a rule are located along the rivers and the coasts in the most favorable spots for man's occupation. They cover from approximately one half to over ten acres of ground. They are kitchen middens and village sites combined, their accumulations reach in depth from a few feet in some to over sixteen feet in others, and while some are fairly late others show human occupation of many centuries. The uppermost of their deposits reach from historic to prehistoric (pre-Russian) time. The accumulations consist of ashes, shells, sea-urchin spines, rotted wood and sod, bones of fish, birds and various mammals, including the whale, some blown dust or silt, and of all the organic refuse and cultural objects of such communities. In their constituents, depth and other conditions they are largely to almost wholly different from the soil of their surrounding territory.

Due to these factors, these sites present wide and in cases seemingly almost absolute botanical differences from the rest of their region. With some experience it is possible to detect such an old village site from as far as it can be seen with some clearness. Its vegetation is darker and much richer in development. It not seldom reaches to over four, five and in places even over six feet in height. When seen at close range, moreover, it is seen to consist, and that materially to

predominantly, of different species of plants from those of the neighborhood. Some of these plants apparently exist nowhere else in the region, while not a few of those of the vicinity, in turn, do not grow on the site of the human habitation. Furthermore, the site-flora of one region in Alaska is not the same as that of another region; and even on the same site there will grow different plants according to the nature and amount of the underlying deposits. And in forested regions these sites, though they may border on woods, remain indefinitely free from brush or trees.

A few examples may be mentioned. On Kodiak Island the main plant of these old sites is everywhere the stinging nettle, interspersed with the wild parsnip; and the elderberry bush, rare elsewhere, was found to be common on the sites over burials. The east slope of the point of our pre-Russian site at Uyak Bay, over slate rock, was full every year with fine forget-me-nots, the only ones seen anywhere in the neighborhood. On Amoknak Island (Unalaska), our site was covered, aside of much luxuriant wild parsnip, with a lot of fine monkshood, fireweed and other flowering plants. While at Agatu, westernmost Aleutians, the sites were covered with high stout grass on the slopes and by a thicket of the wild parsnip, with some monkshood and other flowering plants, over the top.

These are mere general notes. What they endeavor to convey is that the old human sites in Alaska—as doubtless also elsewhere where similar accumulations exist—show botanical phenomena which seem well to deserve an expert study. They show that under different chemical and physical conditions in the ground the same region may produce very different and richer flora than is characteristic of the same under ordinary conditions.

ALEŠ HRDLIČKA

U. S. NATIONAL MUSEUM

NUTRITION VS. GROWTH

IT seems possible that clarity might have been forwarded if Rose[1] in his recent review of his splendid studies on the rôle of the amino acids in nutrition in this journal had interpreted his results solely in terms of nutrition and left growth out of it entirely.

These studies and others like them are not studies of the part nutrition plays in growth; they are investigations of whether or not certain amino acids need be in the diet.

Rose might have written: "Some amino acids are dispensable in the diet of rats. This is shown by the fact that the animals will gain in weight to apparently normal extent when these are omitted from the diet. But these amino acids are essentially universal components of living protoplasm. It is therefore inconceivable that they are dispensable components of living substance. It follows that dispensability in the diet is not evidence of dispensability in protoplasm. What these experiments show, then, is that the rat can make these dietary dispensable amino acids from other dietary constituents."

It would seem as if this is the limit to which interpretation of these and similar data should go when the measure of influence is mass or weight change. Mention of growth seems not only superfluous, but even misleading.

In the first place weight loss on withdrawal of a given amino acid is no evidence that the compound is directly significant to growth. The loss may be due to an absolute increase of catabolism by removal of a brake thereon, quite as much as to an absolute decrease in anabolism by removal of a stimulus thereto. It may be due to loss of stored fat or to water drainage. And it is conceivable that growth—or the continued increase in living and essential structural substance—could go on, even though weight is being lost through disturbance in water balance or undue fat combustion.

The same might also hold true in principle where weight remains stationary on withdrawal of a given amino acid from the food of an animal capable of weight increase.

Further—growth is not single, it is multiple, the combined expression of integrated developmental and incremental factors, processes and functions.

Mass or weight increase is obviously no index to which of these several expressions is subject to a given amino acid.

It is conceivable that an amino acid might factor one phase of growth and not another, and hence its influence—determined as it might be by the physiological age and state of the organism at the time of observation—might be masked by coterminous weight or mass changes in the opposite direction due to expression of other activities—be they growth or metabolic.

Also, mass or weight increase measurements by themselves allow no distinguishment even between increment due to growth and that due to storage of fat or any other substance.

Finally, it is conceivable that a given amino acid may have no direct influence on any growth process at all; but only on some phase of metabolism, interference with which might produce a growth reaction secondarily. Thus a compound might act to sustain maintenance or to act as a brake on catabolism. Either effect might produce retardation in weight increase. Yet this alone would give no basis from which one could tell whether the amino acid in question was significant to maintenance, catabolism or growth.

These several considerations, taken together with

[1] W. C. Rose, SCIENCE, 86: 298, 1937.

the postulate that since all the amino acids which are integral components of living tissue can be justly considered as essential thereto, and hence essential to its production or growth, make it seem advisable to discontinue the practice of attributing general growth dispensability or indispensability to amino acids on the sole basis of weight changes in feeding experiments with rats. Otherwise interpretation is going beyond the limits set by restriction inherent in the method of investigation.

In fact, there is rarely any need to use the word growth in these studies at all. Weight increase or decrease is all that is sufficient and necessary to use in this connection, for this is all that is usually observed. Any other implication is not only inexact—it is unscientific.

FREDERICK S. HAMMETT
RESEARCH INSTITUTE OF THE
LANKENAU HOSPITAL,
PHILADELPHIA

WOLFFIA IN FLOWER

IN SCIENCE for October 1, Henry C. Gilbert remarks, "This is the first report of *Wolffia* in flower in the State of Minnesota, and may be the first report of this matter for the United States."

I quote the following from the Lake Maxinkuckee Report, page 258: "It (*Wolffia columbiana*) was noticed in blossom several times. On October 9, 1900, the plants were in blossom quite freely. We got a tubful in which many were in bloom. They were found in flower also on October 24, of the same year. At Put-in-Bay, Lake Erie, some were noted in blossom about the 19th of July (1908)."

What it would be more desirable to see would be blossoms of the minute duckweed *Wolffiella floridana* (J. D. Thompson), as no flowers nor fruit of the entire genus *Wolffiella* are known. The appropriateness of the name Wolffiella, implying a minuteness even greater than that of *Wolffia,* famous as the smallest flowering plant, raises the question of relative size of *Wolffia columbiana* or *punctata* and *Wolffiella floridana.* On account of its shape *Wolffiella floridana* presents more surface, but perhaps less material than *Wolffia,* so that it rivals *Wolffia* in being the most minute phanerogam, not to say "flowering plant."

H. WALTON CLARK,
Curator
DEPARTMENT OF ICHTHYOLOGY,
CALIFORNIA ACADEMY OF SCIENCES

MORE FRESH-WATER MEDUSAE

ANOTHER occurrence of the fresh-water medusae, probably *Craspedacusta ryderi,* is in Sandy Lake, at Stoneboro, Pennsylvania. This medusa is of fair size, measuring one and one-half cm in diameter, and was found a year ago in very large numbers in this lake by Mr. John Hines, teacher of biology in Stoneboro High School. On its reappearance a few days ago, it was called to our attention, and is now being studied. It is not in as great abundance as last year, but numerous specimens have been collected.

We hope to add to the knowledge of this form, as we have seen several interesting features apparently not previously described.

B. E. QUICK
D. C. MATTHEWS
WESTMINSTER COLLEGE

SPECIAL CORRESPONDENCE

BIOLOGICAL ABSTRACTS

THE new acting editor of *Biological Abstracts,* John E. Flynn, and a special Committee on Arrangements, appointed by the Board of Trustees of *Biological Abstracts,* announce the launching of a new plan which insures *prompt publication of abstracts and indexes,* economy of operation and reorganization of income on a sound basis.

EDITORIAL PLANS

Careful study has been given to methods of speeding up the publication of abstracts, and the following procedures, now to be adopted by the *Abstracts* office, will be of interest to biologists and others:

Abstracting plan. With the aid of biologists and editors of scientific journals, the author-to-editor abstract plan is to be extended. This insures the prompt receipt of abstracts. Payments will be made to collaborators handling entire journals, after the plan of *Chemical Abstracts.* This will make possible an understanding between the abstractors and the editorial office as to how much time can be allowed for abstracting and still have the abstracts appear on schedule.

Prompt abstracts. Abstracts from cooperating journals will appear approximately eight weeks after the original articles. Abstracts from non-cooperating journals (prepared by paid collaborators) are scheduled to appear about twelve weeks after the original articles.

Prompt indexes. The acting editor has committed his organization to an April–May appearance of the index for the 1938 and subsequent volumes prepared under his direction.

Journals covered. There will appear from time to time a stated list of journals which are being abstracted so that biologists may know just what is being covered. The names of journals cooperating under

the author-to-editor abstract plan will be so indicated.

Supporting institutions. A list of supporting institutions will appear on alternate months of the inside cover page of *Biological Abstracts.*

FINANCING

Over the past eleven years the Rockefeller Foundation has supplied nearly three quarters of a million dollars for *Biological Abstracts* to develop and work out its future; the experimental period draws to a close. Numerous inquiries are made as to why the foundation does not continue its support; clearly it is not in the publishing business. It has done its part and more too to see *Abstracts* on its way. It now becomes the duty of institutions concerned with biological research and teaching to cooperate with biologists in taking over the responsibility of making new knowledge in this field available to all.

The Committee on Arrangements, working in close touch with the *Abstracts* office, the Periodicals Committee of the American Library Association and the Union of American Biological Societies has formulated a new financing plan.

The essence of this plan is that each institution will become a *master subscriber.* The cost of the *master* subscription to educational institutions in the United States depends upon the number of biologists in any given institution; additional copies in any number desired will be supplied to departmental or other branch libraries at $7.00 per volume. The method of allocating funds will vary in different institutions, because the new plan must, in the case of the larger institutions, be considered a subsidy.

Individuals associated with an institution which holds a *master* subscription may secure a personal subscription at the new low rate of $7.00 per year. If the *master* subscription is cancelled at the end of the year for any reason, the individuals in that institution automatically lose their privilege to subscribe.

Many interested inquirers have raised the question: "Why isn't *Biological Abstracts* offered at a flat rate to all subscribers?" Particularly careful study has been given to this question, and until the subscription list is larger, it is neither feasible nor possible. The greater service offered by the new *Biological Abstracts* will greatly increase the subscription list and make possible a low flat rate. At the present time, if there were a flat rate, each subscriber would presumably pay over $30.00 per volume to provide the minimum funds necessary to continue publication. This would mean that practically all the 700 personal subscriptions would be dropped. The result: 1,250 institutional subscribers would have to pay over $50.00 per volume. On this basis, probably 300 small institutions would have to discontinue, and where would *Biological Abstracts* be with the flat rate? And to whom would it have been of greater service?

FINANCING AGREEMENT

At a meeting in New York on November 27, in which the American Library Association and the Committee on Arrangements were represented, it was agreed that librarians would arrange a subsidy for *Biological Abstracts* from their institutions (to be contributed to by departments of biology, libraries and administrations where necessary). The amount of this subsidy depends upon the number of biologists in any given institution as described above, and may not continue for more than two years. At the end of this two-year period, *Biological Abstracts* must go to all libraries at a low flat rate.

The chairman of the Periodical Committee of the American Library Association is willing to urge all librarians to do their part in arranging support for *Abstracts,* with *one reservation*—that every biologist agrees to support *Biological Abstracts* in an amount comparable to that given *Chemical Abstracts* by the chemists, to *Science Abstracts* by the physicists (about $3.50 annually), and to *Psychological Abstracts* by the psychologists ($5.00 annually). The American Society of Zoologists has been the only group of biologists to provide in the past anything approaching this support for *Biological Abstracts.*

If the members of all biological societies are willing to support *Biological Abstracts,* this committee will continue its work and see that every pledge for the future is carried out. This would mean that approximately $3.00 annually would be collected by one of the societies of which any given biologist is a member; this single payment of $3.00 per biologist per year would be transmitted to the Union of American Biological Societies. The Union would thus have a complete catalogue of all the biologists in America, and would assume the definite task of handling the biologists' support for *Abstracts.* Thus, no American biologist could be a member of a biological society without recognizing and meeting his or her responsibility toward indexing and abstracting the biological literature. By payment of an additional $4.00 annually, any biologist could secure a subscription to *Abstracts* (provided his institution is a subscriber).

The acceptance of this plan will provide a permanent and self-supporting basis for *Biological Abstracts.* Publication of abstracts would thus become recognized as the joint obligation of biologists and their institutions.

Failure on the part of biologists to accept the responsibility outlined above will be understood by the Committee on Arrangements to mean that its efforts should be abandoned. Under such circumstances pub-

lication would cease with the current volume. Officers of the various biological societies will get in touch with their members in the near future, and final action will be taken at the Indianapolis meetings of the American Association for the Advancement of Science as well as at other centers where biological societies are meeting.

The Committee on Arrangements for Biological Abstracts

THE ANNUAL MEETING OF THE UNION OF AMERICAN BIOLOGICAL SOCIETIES

THE annual meeting of the council of the Union of American Biological Societies has been scheduled for Wednesday evening, December 29, in the Palm Room of the Claypool Hotel, Indianapolis, Ind., at 8:30 P. M. During the past year the union has been active in lending its support to such projects of broad interest in the support of *Biological Abstracts*, the Woods Hole Conference on Aging and the teaching of the biological sciences.

The report concerning *Biological Abstracts* by the Committee on Arrangements will be of great importance to those interested in seeing the *Abstracts* become self-supporting beginning with 1938. The importance of working out some permanent and satisfactory financial basis for keeping this valuable aid to research and teaching is recognized by most biologists.

These items, together with a brief report on the American Documentation Institute and other pertinent business, will be considered at the annual meeting. It is hoped there will be a full attendance of those interested, together with the official society representatives to the council.

GEORGE W. HUNTER, III,
Secretary

SOCIETIES AND MEETINGS

THE INDIANA ACADEMY OF SCIENCE

THE fifty-third annual meeting of the Indiana Academy of Science was held at Manchester College, North Manchester, on November 4, 5 and 6, under the presidency of Will E. Edington, professor of mathematics, DePauw University. After the usual transaction of business scientific papers were presented on November 5 in sectional programs: *Archeology,* 5 papers, Glenn A. Black, Indianapolis, *chairman; Bacteriology,* 3 papers, H. M. Powell, Lilly Research Laboratories; *Botany,* 17 papers, C. L. Porter, Purdue University; *Chemistry,* 9 papers, Paul D. Wilkinson, Indiana State Teachers College; *Geology and Geography,* 12 papers, W. LeRoy Perkins, Indiana State Teachers College; *Mathematics,* an address on "The Foundations of Geometry" by Karl Menger, University of Notre Dame; *Physics,* 15 papers, Leslie I. Steinbach, Central Normal College; *Psychology,* 7 papers, P. L. Hightower, Central Normal College; *Zoology,* 21 papers, W. P. Allyn, Indiana State Teachers College.

On the evening of November 5 Dr. Edington gave his presidential address, entitled "Science and Modern Thought." Other outstanding papers were: "The Homeland of Indian Corn," Paul Weatherwax, Indiana University; "A Tentative Outline of the Prehistory of Indiana," Eli Lilly, Lilly Research Laboratories; "The Goodall Focus of Elemental Hopewellian in Indiana and Michigan," Glenn A. Black, Indiana Historical Society; a series of papers by J. E. Potzger, Butler University, and his collaborators on "The Study of Fossil Pollens" as obtained from various Indiana bogs; "The Mineral Wool Industry of Indiana," William D. Thornbury, Indiana University; "Possibilities for Conservation in an Agricultural State," Kenneth M. Kunkel, director, Division of Fish and Game, Indiana State Conservation Department; "Insects of Indiana for 1937," J. J. Davis, Purdue University; "Staining Methods for Protozoa," W. P. Allyn, Indiana State Teachers College; the papers in zoology for the most part were presented as demonstrations rather than as formal communications.

On November 6 the entomologists had a meeting in charge of H. G. Nester, Butler University, to discuss their special problems. The taxonomists had a meeting, mostly composed of botanists, under the direction of Dr. Theodor Just, University of Notre Dame. The Junior Academy of Science, consisting of science clubs in secondary schools, held its meeting and displayed its exhibits, with George Hoffer, West Lafayette, in charge.

Officers elected for 1938 are: *President,* Eli Lilly, Lilly Research Laboratories; *Vice-president,* T. C. Yuncker, DePauw University; *Secretary,* W. P. Allyn, Indiana State Teachers College; *Treasurer,* W. P. Morgan, Indiana Central College; *Editor,* Paul Weatherwax, Indiana University; *Press secretary,* Will E. Edington, DePauw University.

Purdue University was chosen as the place of the next annual meeting. About 350 members and guests were present.

M. W. LYON, JR.,
Press Secretary

THE UTAH ACADEMY OF SCIENCES, ARTS AND LETTERS

THE Utah Academy of Sciences, Arts and Letters held its autumn meeting at Weber College, Ogden, Utah, on November 5 and 6. The academy banquet

was held on Friday evening from 6:00 to 8:00 P. M. in the Hotel Ben Lomond. Dr. H. A. Dixon, Mr. Reed W. Bailey, Superintendent W. K. Hopkins and Mr. M. T. Allred briefly discussed the theme—"Status of Sciences, Arts and Letters in Ogden." There were 116 attending the banquet.

At 8:00 P. M. there was a public meeting in the Weber College Auditorium. President Milton Bennion presided. The following members presented short papers as follows: "Conserving Cultural Civilization in Utah," Dr. A. L. Beeley; "Conserving Rural Civilization in Utah," President E. G. Peterson, and "Conserving Intellectual Freedom in Utah," Professor John C. Swenson. About 400 members and visitors were in attendance.

The executive council breakfast was held at 7:15 on Saturday morning in the Weber College Cafeteria. The 14 members present were the guests of the president of Weber College, Dr. H. A. Dixon.

A general session meeting for the transaction of business was held at 9:15 A. M. The names of 23 new members were presented to the academy membership for approval. It was decided to hold the thirty-first annual meeting of the academy at the Utah State Agricultural College in Logan, Utah, in May, 1938.

The general session adjourned at 9:45 for section meetings. About 30 papers were presented in the biological, physical, social and arts and letters sections.

VASCO M. TANNER,
Permanent Secretary-Treasurer

SPECIAL ARTICLES

THE RELATION BETWEEN VISUAL ACUITY AND THE OPTIC PROJECTION CENTERS OF THE BRAIN

THE accepted view to-day concerning the central neural basis of visual acuity is that the projection areas of the retina on the cortex, *i.e.*, the striate areas of the occipital lobes, contain the spatial arrangement of cells which is necessary for the neural resolution of small changes in visual detail or pattern. In the present paper evidence is offered which suggests certain modifications of this theory. The experiments described below prove that only under limited conditions does the abolition of the cortical centers of vision bring about a reduction in visual acuity.

In the investigation described hereafter, the striate cortex was completely extirpated in six cats under aseptic conditions. The operations were carried out in one stage under Nembutal anesthesia. After the animals had recovered from the operative shock, their visual acuity was tested at irregular intervals by observing the presence of pursuit movements of the head and eyes made in response to rotating striped patterns of varying widths, presented on the inside surface of a large cylinder (Fig. 1). Measurements of minimum separable acuity were made by presenting the animals with moving, alternate, black and white lines of equal width. For tests of minimum visible acuity, single lines rotating against a contrasting background were employed. In addition, observations were made when patterns containing a varying number of lines were presented to the animals. In all the tests the animal was restrained in a box holder at the center of the cylinder, with its eyes approximately 50 cm from the moving patterns.

When animals are given the various visual acuity tests described above, the main defect of vision as a result of extirpation of the optic projection areas of

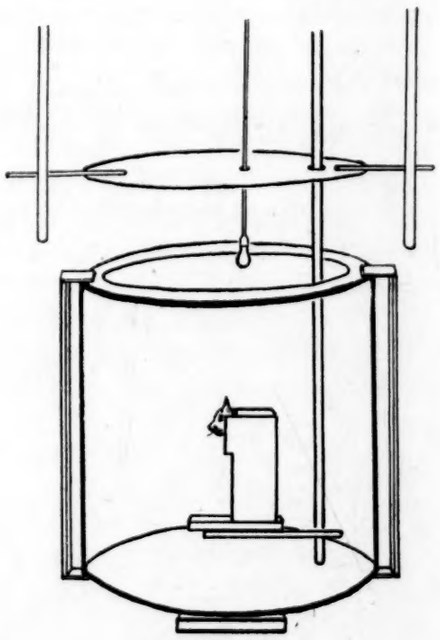

FIG. 1

the cerebral cortex is the abolition of pursuit responses to single lines, to a limited number of adjacent black and white lines (usually below three or four), and to either black or white striations spaced at wide intervals in the visual field. With black lines 0.1 cm in width, responses do not occur if the stripes are separated by distances greater than 2.5–7.6 cm, whereas with white lines the corresponding limit is 15.2–22.9 cm. These defects in visual acuity presumably underlie the commonly noted fact that higher mammals lacking the cortical connections of the visual system are unable to respond to simple objects held or moved in the field of vision,[1,2] and to discriminate between simple geometrical patterns.[2,3]

[1] D. G. Marquis, *Proc. Asn. for Research in Nervous and Mental Disease*, 13: 558–592, 1934.

[2] M. Minkowski, *Arch. f. d. ges. Physiol.*, 141: 171–327, 1911.

However, defects in visual acuity do not occur in consequence of cortical extirpations if animals are tested with lines which cover most of the visual field and which are spaced at the proper intervals in the field of vision. The visual acuity of the operated cats in responding to alternate black and white stripes under these conditions is at least 11 minutes of arc, the maximum acuity which could be measured by the different patterns used in this part of the experiment.

More adequate determination of threshold acuity of the cats was provided by the use of the separated black or white striations, which were spaced at distances of 2.5 cm on the rotating cylinder. The visual acuity of the operated animals in responding to white stripes was found to be 0.5 to 0.7 minutes of arc, whereas for the black lines the acuity of vision was determined to be between 4.1 and 8.2 minutes of arc. The visual acuity of normal cats is approximately equal to that found in the operated animals, both when measured by the method here described and when determined in a discrimination set-up.[4]

The high degree of visual acuity which the operated animals display in responding to complex patterns moving across the visual field is a matter of spatial summation of impulses in subcortical optic centers, for the responses do not occur with single lines or to stripes too widely distributed in the visual field. However, in order that the refined vision in these animals may exist at all, the subcortical centers must be anatomically differentiated to a degree sufficient to mediate the acuity of vision demonstrated.

It seems to the writer that the facts first described are of importance in explaining how the brain works in permitting mammals to respond to small differences in visual pattern. The belief[5] that the projection areas of the cortex are the only mechanisms which are sufficiently organized to mediate detailed pattern vision is evidently incorrect when the present results and interpretations are recognized. Instead, there seems to be a much more complex integration of function in the nervous system in controlling impulses basic to pattern vision than the mere projection of "neural figures" on the visual areas of the cortex. Evidently, the facts concerning the neural relations of visual acuity reported here indicate an unrecognized significance in the complexity and the nature of the projection of retinal fibers upon the pretectal region and upon the superior colliculus of the midbrain.

KARL U. SMITH

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[3] K. S. Lashley and M. Frank, *Jour. Comp. Psychol.*, 17: 355–393, 1934.

[4] K. U. Smith, *Jour. Genet. Psychol.*, 49: 297–313, 1936.

[5] S. Poliak, "The Main Afferent Fiber-Systems of the Cerebral Cortex in Primates." Berkeley: Univ. Calif. Press, 1932. Pp. xiv + 370.

INDUCTION OF POLYPLOIDY IN NICOTIANA

IT is well known that tetraploidy may be readily induced experimentally in the tomato through the production of shoots from the callus tissue growing over the cut surface of decapitated stems. Nicotiana, however, fails to produce callus tissue and shoots in response to this method of treatment. Attempts to modify the treatment by application of yeast extract, lanolin or petroleum jelly to the cut surface or by enclosing it in a moist chamber have also been unsuccessful. When, however, the cut surface was smeared with a hetero-auxin paste made by thoroughly mixing crystals of indole-3-acetic acid with melted anhydrous lanolin in the proportion of 10 milligrams of the former to each gram of the latter, prompt development of callus tissue occurred. After about six weeks numerous buds were produced which rapidly developed into well-formed shoots, many of which have proved to be tetraploid.

The hetero-auxin treatment was first applied in a shaded greenhouse to plants of the F_1 *sylvestris-tomentosa* and F_1 *sylvestris-tomentosiformis* hybrids. From 125 treated plants, an approximately random lot of 1,973 callus shoots has been examined. In one subsample of 1,324 shoots, including all the first callus shoots obtained and about 800 normal shoots which were eliminated later directly from the cutting flats, 170 were tetraploid; while in another subsample of 649 plants no less than 102 were tetraploid, including two narrow-leaved shoots. Subsequent production of callus shoots has brought the number of tetraploids to well over 500. Besides the tetraploids about 50 shoots are of an abnormal type, having very thick stems, thick, malformed leaves and exceptionally large stomata (probably 8n), and six, each of a different type, had narrow leaves or other characteristics which appeared to mark them as modified diploids or tetraploids. The high proportion of tetraploidy and the apparent presence of higher degrees of polyploidy seem to indicate a positive effect of the treatment beyond that of merely inducing production of callus tissue.

Classification of the shoots was based on comparative size of stomata which appeared to be a perfectly reliable criterion, if examinations were made of small leaves at comparable stages of development. A few tetraploid shoots of *sylvestris-tomentosiformis* have reached maturity and their tetraploid constitution is evident from examination of microsporocytes and pollen production. They exhibit a flat plate with apparently 24 pairs of chromosomes (24 bodies have actually been counted), and regular meiotic behavior, as contrasted with the highly irregular distribution of the 24 chromosomes of the normal hybrid. Pollen

counts of 1,374 grains gave 85 per cent. of normal-appearing grains, whereas only .5 per cent. were good in a sample of 1,465 grains of F_1 pollen. The doubling has evidently resulted in the establishment of an amphidiploid condition, as is to be expected in sterile hybrids of this kind.

The hetero-auxin treatment has also been applied successfully to plants growing in the field. Under these conditions plants of *N. glauca, N. tomentosa, N. tomentosiformis* and F_1 *sylvestris-tomentosa* have produced callus shoots abundantly and tetraploid shoots have been found among them in even higher percentages than in the greenhouse. Plants of *N. tabacum* (Maryland Mammoth, *purpurea* and *purpurea Mammoth*), F_1 *glutinosa-tomentosa* and F_1 *glutinosa-sylvestris* have produced a few callus shoots, among them some tetraploids. Plants of *N. rustica* (*brasilia*), *N. wigandioides* and F_1 *glutinosa-tomentosiformis* have produced callus tissue and roots but as yet no callus shoots. It seems probable, however, that the relatively poor reponse in these instances is to be ascribed to poor condition of the plants, rather than to unsuitability of the treatment. To be regularly successful, the treatment must be applied to young plants in good growing condition.

Successful outcome of the treatment appears to depend upon careful attention to a number of details. Plants should be decapitated so that five or more good leaves remain on the plant. Internodal cuts respond to treatment just as well as those made through or close to nodes. The cut surface should be covered with a thin layer of the hetero-auxin paste immediately after decapitation, after which it should be protected, especially if exposed to direct sunlight, by covering with two or three folds of muslin or with a manila paper bag loosely tied to the stem. When buds begin to develop the covering should be gradually removed. It is important to have the plants in good growing condition and to keep them so during the course of the experiments. The plants should be disbudded immediately after treatment and any new axillary shoots should be removed as they appear. Successful treatment is followed by prompt development of callus tissue, which may in some instances take on a rounded, tumor-like appearance. After four to six weeks buds begin to develop, often so thickly as to completely cover the callus surface with a close tuft of shoots. The shoots may be classified when two or three inches long by examination of strips of epidermis peeled from the lower surface of the leaves. Callus shoots may be removed and treated as cuttings, or one or two selected ones may be left to develop in place after removal of the rest. There seems to be a tendency for normal shoots to develop more promptly than polyploid ones, so that it is advisable to remove the earlier shoots as soon as they are large enough to be examined, in order to give the less rapidly developing polyploid shoots a chance.

The writer is indebted to Dr. Roy E. Clausen for general supervision of these experiments and to Dr. Folke Skoog for assistance in the use of hetero-auxin preparations.

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ADENOMATOUS LESION IN STOMACH OF STRAIN I MICE

THE I strain of mice was originated by Dr. L. C. Strong[1] in 1927 by crossing a pink-eyed dilute brown and a dilute brown piebald stock. From this cross he selected five recessive characters, namely: pink-eyed, dilute, brown, non-agouti and piebald and continued the strain by brother-to-sister mating. Female mice of this strain seldom lived longer than fourteen months.

A litter of strain I mice was procured from the Roscoe B. Jackson Memorial Laboratory and the progeny of these mice, obtained by brother-to-sister mating, have been used as experimental animals in this laboratory. The strain has been of considerable interest for, up to the present time, none of the breeding females has developed a spontaneous mammary gland carcinoma. Furthermore, the mice have proved to be very resistant to the growth of transplantable mouse sarcomas 37 and 180 as well as resistant to the induction of subcutaneous tumors by lard solutions of carcinogenic hydrocarbons.

It was during the course of an experiment in which strain I mice had been injected subcutaneously with a lard solution of 1:2:5:6-dibenzanthracene that the stomach lesion was first encountered. The question arose as to whether the lesion was induced by the carcinogenic compound or whether it occurred spontaneously in members of this strain. Consequently strain I mice which had not been subjected to any experimental procedure were sacrificed and examined for the presence of stomach growths.

Twenty-one mice, aged 2.5 to 15 months, were killed and autopsied immediately. At three or four months, a progressive gastric lesion began, which was fairly comparable in brothers and sisters and in more distant relations of the same age. Practically all animals ten months old and over showed the condition in advanced form.

The principal change occurred in the pyloric chamber of the glandular portion of the stomach, which became large, solid, firm, opaque and slightly congested, with small grey nodular elevations on the serosa. In old mice the stomach contained little food and the cardiac chamber was compressed against the

[1] This information concerning strain I mice was kindly supplied by Dr. Strong in a personal communication.

costal cage. The glandular mucous membrane was thickened with coarse, grey, hypertrophied rugae. This change began abruptly at the constriction in the middle of the stomach and decreased progressively, disappearing near the pyloric orifice, with the most marked involvement along the greater curvature. Microscopically, the changes consisted of a pronounced hyperplastic adenomatous overgrowth of the glandular mucous membrane, with coarse polypoid projections resembling hypertrophied rugae. The glandular structures became dilated and irregular in outline with the formation of microcysts in some specimens. Collections of inflammatory cells were scattered through all coats of the viscus. The cardiac chamber only occasionally showed slight hypertrophy and hyperkeratosis of the squamous epithelial lining. Coincident with the development of the lesion, the normal distribution of the various cell types in the glandular mucous membrane was disarranged. The epithelial cells became irregular in size, shape and staining, and showed squamous, cuboidal, polygonal and columnar forms with numerous mitotic figures. Some cells were necrotic, desquamated and keratinized and a few acini appeared completely filled with keratin. Although the process usually appeared superficial and well limited to the mucosa, in several specimens distended acini were observed indenting the basement membrane and lying partly below it. Furthermore, in nine of twenty-one cases, a few small fragments of atypical epithelial cells were found below the basement membrane, usually in the submucosa but also in the muscle and, in two cases, in the lumens of veins. These deeply situated deposits rarely consisted of more than one or two fragments in a given specimen and their significance in this connection has not been definitely established. No metastases were observed in any instance. Starvation, dependent upon alteration of the mucosa and occlusion of the gastric lumen appeared to be the cause of death in many mice of this strain.

So far, with the exception of three old strain C_3H mice aged 22.5, 23 and 24 months, analogous lesions have not been encountered in the stomachs of mice of various other pure strains.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

AN IMPROVED INSTRUMENT FOR THE INTRACEREBRAL INOCULATION OF EXPERIMENTAL ANIMALS

THE inoculation of animals by the intracerebral route is a procedure frequently employed in research and diagnostic laboratories. This method necessitates the use of a pointed instrument to penetrate the skull, except when the experimental animals are young mice. Of the wide variety of commercially available trephines and improvised instruments now commonly used for this purpose in different laboratories, we have not found any that is as satisfactory as the instrument to be described in this note. Because of its construction, it can not be inserted too deeply, thereby injuring the brain. Furthermore, it has the advantage of a groove which permits insertion of the inoculating needle without necessitating the withdrawal of the instrument, thereby eliminating the possibility of losing the hole through the skull. Any one who has used the intracerebral method for inoculation has experienced this time-consuming annoyance.

The instrument may be made of any suitable material. We have found that common nails serve admirably. They are cheap and universally available. A small vise and two steel files are all the equipment required. The procedure is as follows:

(1) File off one side of the nail to make an oblique plane (Fig. 1–A).

(2) Using a three-cornered file, make a longitudinal groove down the middle of the oblique plane (Fig. 1–B).

(3) File a circular shelf near the point, extending inward for one third of the nail's diameter (Fig. 1–C).

(4) File a triangular point, the size and depth of which is determined by the thickness of the skull of

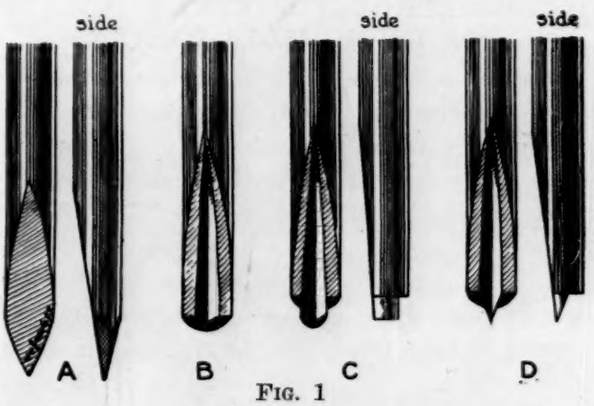

FIG. 1

the experimental animal for which the instrument is destined. This point is separated from the rest of the instrument by the shelf (Fig. 1–D), which serves to prevent penetration of the skull more deeply than desired (Fig. 1–D). By extending the groove (Fig. 1–A) to the very point, the inoculating needle can enter the brain substance without necessitating withdrawal of the instrument.

We have used common nails with complete success and have found that the following sizes are the most convenient for the experimental animals designated: for old mice, rats, etc., 16 penny (3½ inch) nails; for guinea pigs, rabbits, ground squirrels, etc., 30 penny (4½ inch) nails; and for ferrets, monkeys, woodchucks, etc., 60 penny (6 inch) nails.

The procedure of intracerebral inoculation, as routinely carried out in our laboratory with the instrument just described, is as follows. The site to be inoculated is usually in the parietal region overlying the right cerebral hemisphere, midway between the external canthus of the right eye and the external occipital protuberance. Following anesthetization of the experimental animal and suitable preparation of the skin, a small incision is made through the skin a short distance to one side of this mid-parietal site. The point of the instrument is inserted through the skin incision, the scalp is retracted with it, and the skull is penetrated at the site described. The point of the instrument is left in place in the skull and the needle of the syringe containing the suspension to be injected is slid along the groove until, penetrating the skull beside the point, it enters the cerebral cortex. The desired amount of inoculum is injected, and the needle and the instrument are withdrawn together. Following withdrawal, the retracted skin, by immediately rebounding, provides a satisfactory covering for the opening through the skull.

JEROME T. SYVERTON
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FILTER-METHOD FOR CLEAN ISOLATION OF TRICHINELLA-LARVAE

IT is well established that Trichinella-larvae having entered the stomach move to the small intestines of the host in order to invade instantly the mucous membranes. The following procedure makes use of this activity of the larvae as it is done in the Bearman-method.

The neck of a glass funnel is transversally cut and a perforated rubber stopper slipped over the stump in order to hold a test-tube (centrifuge) in a water-tight position. The funnel rests on a tripod ring (see Fig. 1). A cylindrical fruit (Mason) jar, smaller in circumference than the funnel, a fitting glass cover, four layers of gauze and a rubber stopper (the latter in order to close the inner opening of the funnel, if desired) may be kept ready.

For use, both funnel and test-tube are filled with tap water (2 per cent. sodium chloride solution is preferable). Thoroughly minced Trichinella meat is mixed with digestion fluid and filled into the jar. Its

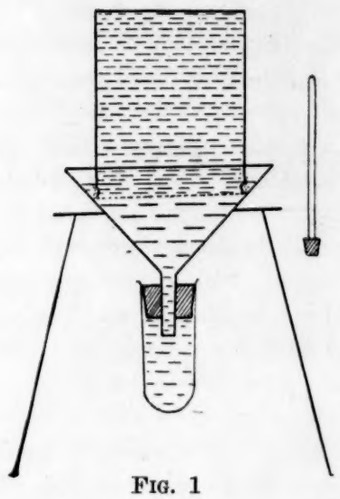

FIG. 1

top is then covered with four layers of gauze, which is tightly ligated around the rim. The glass cover is now pressed against the gauze filter and the jar placed upside down into the funnel. After the cover has been cautiously removed the jar rests in an upright position in the funnel. The apparatus remains undisturbed in the incubator.

After completion of the digestion the glass cover is inserted, the jar removed, the inner opening of the funnel closed with the aid of the rubber stopper, and the fluid in the funnel decanted. More recently we omit the use of glass cover and rubber stopper for these operations without disadvantage. The sediment in the test-tube contains the total amount of living Trichinellas of the digested meat free from coarse particles. Further operations follow the ordinary methods.

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